PTO: 2006-0621

Japanese Published Unexamined (Kokai) Patent Publication No. 01-096374; Publication Date: April 14, 1989; Application No. 62-251174; Application Date: October 5, 1987; Int. Cl.[4]: C23C 14/34 H01J 37/305 H01L 21/285; Inventor: Chiharu Ishikura; Applicant: Tanaka Kikinzoku Kogyo KK; Japanese Title: Supattaringuyou Kuraddo Taagettozai (Clad Target Material for Sputtering)

Specification

1. Title of Invention

Clad Target Material for Sputtering

2. Claim

A clad target material for a sputtering wherein a target material is joined to a Cu substrate, characterized in that the purity of the Cu substrate is 99.7% or higher; at least one type or more types from Zn, In, Mn, Sb, Be, Ca, Cr, Te, Y, Nb, Mo, Ta and Sn are added at 100 to 3000 weight ppm at the total.

3. Detailed Description of the Invention

[Field of Industrial Application]

As for a thin film forming technology used in each industrial field, this invention pertains to an improved clad target material that is used for a sputtering for forming a thin film element, an electrode and a wiring at an IC substrate production process particularly in the semiconductor field.

[Problem to Be Solved by the Invention]

A conventional sputtering target material is used while being joined to a backing plate with a metal bonding material. However, with this method, it is difficult for the target to be replaced by detaching it from the backing plate. As a solution, the target is detached together with the backing plate. The operation at each step is extremely complicated as follows. It takes an extended period for the replacement. It is necessary to add a device to prevent contamination from a location where the piping for cooling water for the target material that cools the backing plate side is detached to a vacuum tank of a sputtering device at the replacement of the target material.

Accordingly, the target material will not be joined with the metal bonding material. As shown in Fig.1, a target material 1 is directly brought into contact with and held by a backing plate 3 via a ring-shaped attaching jig 2. In this case, as shown in Fig.2, a high purity Cu substrate 4 with sufficiently conductivity as a clad target material 6 is joined to the side where the target material 1 is brought into contact with the backing plate 3 applying a metal bonding material 5 so as to improve the cooling effect of the target material 1 on the backing plate 3. As shown in Fig.3, the Cu substrate 4 of the clad target material 6 is tightened to the backing plate 3 using the ring-shaped attaching metal fitting 2. However, in the case of a Cu backing plate, the backing plate 3 and the Cu substrate 4 become being bonded with each other in use. As a result, it becomes difficult for the Cu substrate 4 to be detached from the backing plate 3 after the use.

[Purpose of the Invention]

The present invention is produced to solve the aforementioned disadvantages and aims to offer a clad target material for a sputtering in that a Cu substrate will not be thermally bonded onto a backing plate in use and that can be easily detached from the backing plate after the use.

[Measures for Solving the Problem]

The technological means of the invention for eliminating the disadvantages is characterized in that the high purity quality of the Cu substrate of the clad target material is not lost, more specifically the Cu purity of the substrate is predetermined at 99.7% or higher; that at least one type or more types from Zn, In, Mn, Sb, Be, Ca, Cr, Te, Y, Nb, Mo, Ta and Sn are added at 100 to 3000 weight ppm at the total.

[Effect]

Because the 99.7% or higher purity of the Cu substrate at the sputtering clad target material as constituted as described above, a sufficient cooling effect from the backing plate side is achieved due to high thermal conductivity. Because of the adding of at least one type or more types of the aforementioned metal at total 100 to 3000 weight ppm, the diffusion of Cu is controlled whereas recrystallization increases. Thereby, a thermal bonding of the clad target material to the backing plate in use will not occur.

The reason that the amount of the metals is predetermined at total 100 to 3000 weight ppm at at least one type or more types is as follows. If the amount is below 100 weight ppm, the thermal bonding to the backing plate cannot be presented. If the amount

exceeds 300 weight ppm, the thermal conductivity deteriorates to decrease the cooling effect.

[Working Example]

The working example of the sputtering target material of the invention is described long with an example of prior art target material.

An Ir target material 1 of a 152.0 mm diameter at a 1.0 mm thickness is joined to a Cu substrate 4 of a 152.0 mm diameter at a 4.0 mm thickness, made of a material being composed of components as indicated on the left column of the table as below, as shown in Fig.2, applying an In metal bonding material 5, to obtain the sputtering clad target material 6.

As shown in Fig.3, ten clad target materials 6 are separately pressed against a Cu backing plate 3 using a ring-shaped attaching jig 2 made of SUS 304, having a ⌜-shaped cross-section, a 170.0 mm outer diameter, a 153.0 mm upper end inner diameter, a 149.0 mm lower end inner diameter and a 6.0 mm thickness. Eight locations in the circumferential direction are tightened with screws to adhere each clad target material 6 onto the backing plate 3. After setting the clad target material 6 on the cathode inside a vacuum tank of a sputtering device as not shown in the drawing, a sputtering is performed at 1 KW DC for 3 hours to form an Ir film onto a substrate on the anode. When the presence and absence of the bonding between the clad target material 6 and the backing plate 3 are checked at the sputtering, the results as shown on the right column of the table as below are obtained.

	Composition of the Cu substrate	Presence and absence of

	Cu (%)	Metals added (ppm)	bonding to the backing plate (pieces)
Working Example 1	[Please refer to the original description]		
Working Example 2			
Working Example 3			
Working example 4			
Working Example 5			
Working Example 6			
Working Example 7			
Working Example 8			
Working Example 9			
Working Example 10			
Working Example 11			
Working Example 12			
Working Example 13			
Working Example 14			
Working Example 15			
Working Example 16			
Working Example 17			
Example 1 of prior art clad target material		Pb, P, Se, S and Hg at 30 or less ppm each as impurities	
Example 2 of prior art clad target material		Pb, P, Se, S and Hg at 10 or less ppm each as impurities	

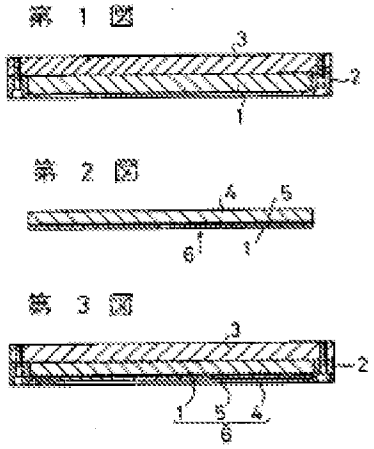
As is clear in the table, the clad target materials 6 of Examples 1 and 2 of prior art clad target materials, which are bonded to the backing plate 3, are found in nine sputtering devices and seven sputtering devices out of 10 sputtering devices, respectively. The bonded clad target materials 6 cannot be detached from the backing plate 3 and need to be replaced by being detached together with the backing plate 3. On the other hand, no clad target materials 6 of the working examples are bonded to the backing plate 3. The reason for it is that the thermal bonding of the Cu substrate 4 to the backing plate 3 is prevented because of the adding of at least one type or more types from Zn, In, Mn, Sb, Be, Ca, Cr, Te, Y, Nb, Mo, Ta and Sn to the Cu substrate 4 of the clad target material 6 at total 100 to 3000 weight ppm.

[Advantageous Effect of the Invention]

As is described above, as the sputtering clad target material of the invention uses the Cu substrate with the 99.7% or higher purity, the thermal conductivity is sufficient to perform an efficient cooling from the backing plate side. Furthermore, because at least one type or more types from In, Mn, Sb, Be, Ca, Cr, Te, Y, Nb, Mo, Ta and Sn are added to the Cu substrate at total 100 to 3000 weight ppm, the diffusion of Cu is controlled while recrystallization increases. Thereby, the Cu substrate will not be thermally bonded to the backing plate in use and be easily detached therefrom after the use.

4. Brief Description of the Drawings

Fig.1 is a cross-sectional view illustrating prior art sputtering target material being attached to a backing plate. Fig.2 is a cross-sectional view illustrating a sputtering clad target material. Fig.3 is a cross-sectional view illustrating the clad target material of fig.2 being attached to a backing plate.



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11/01/05
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